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AN ANALYSIS OF RETAIL DISTRIBUTION SYSTEMS

PHILIP J. MASON

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OF

RETAIL DISTRIBUTION

SYSTEMS

by

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//
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Submitted in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE
IN
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ABSTRACT

The rise of the Defense Supply Agency and the General Services
Administration as significant factors in the wholesaling of military
material emphasize the need for skillful management of those broad
aspects of the Supply System remaining under Navy control. The
largest such aspect is retail distribution, "the functional re-
lationship between the Navy consumer and the supply activity in
direct support of that consumer". This paper describes the advent
and growth of self-service as a tool of retail distribution, defines
alternative techniques, proposes a means of comparing the cost
effectiveness of the various methods, and illustrates this means of
comparison through a hypothetical situation. The primary argument
is not for a particular system, but that all systems must be care-
fully and objectively analyzed prior to commitment to one alternative
or another.

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CHAPTER I

STATEMENT OF THE PROBLEM

Since its inception in 1916, customer self-service has become increasingly popular in commercial retailing.[1] A number of reasons have been advanced in explanation of this trend. While impulse buying is an important aspect commercially, it seems a valid synthesis to consider that cost reduction is the most significant rationale for permitting or urging customers to take on increasing amounts of those retailing functions once performed by clerks or other employees of the entrepreneur. In the competitive climate of commercial retailing[2] any reduction in the cost of supplying consumers - other things being equal - tends over time to increase demand and consequently contributes to profit maximization.

More recently, self-service has achieved substantial popularity as a means of retail distribution in the Federal Government. Pertinent to the purview of this paper, the Navy's Supply System has adopted this method in growing numbers of its "branch stores". An incomplete but adequately indicative timetable reflects the latter trend:

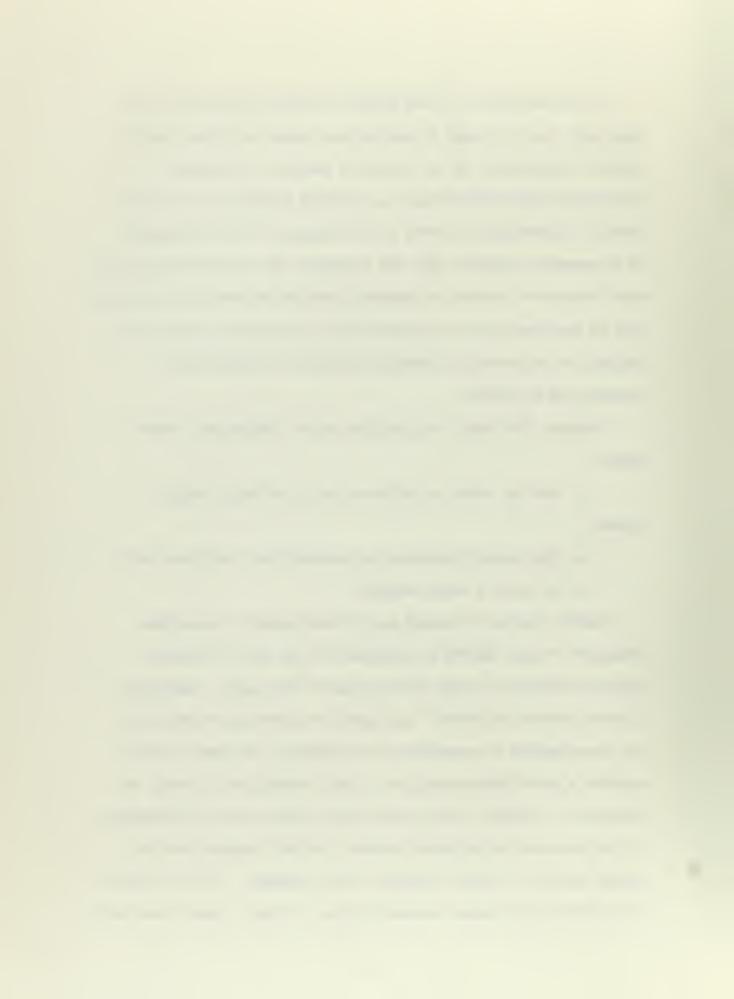| Activity	Initiated Self-service
NOTS China Lake	1957
NSY Long Beach	1960
NSC San Diego	1961
NSD Newport	1961
NSB New London	1961

It is the purpose of this paper to examine this trend, to at least ask, and to attempt to answer, some questions which deserve careful consideration in the requisite analysis of potential advantages and/or disadvantages in specific applications of self-service. Hopefully, an aspect of this purpose is the development of a persuasive argument that the conversion to or retention of self-service must be a matter of continuing evaluation through the measurement of performance and comparision with appropriate criteria. The analysis of self-service operations should be a tool both of planning and of review.

Perhaps, like Gaul, this problem can be divided into three parts:

a. Why the trend to self-service in the Navy's Supply System?

b. What supply functions are susceptible to self-service?

c. Is there a better method?

However, before attacking any of these parts, a conceptual framework of sorts should be described for the sake of clarity. Retail distribution is the cental theme of this paper. Combining relevant phrases of Webster[3] and Roget[4], "distribution" describes the apportionment of commodities to consumers. The term "retail" connotes a sale "individually or in small quantities" directly to consumers. Therefore, within the supply system, retail distribution is the functional relationship between the Navy consumer and the supply activity in direct support of that consumer. The term covers the spectrum from support rendered afloat by ships' supply departments

to their landlocked counterparts in Air Stations, Naval Stations, and Naval Shipyards, as well as issues of Supply Centers and Depots directly to consumers.

Furthermore, not to constrain but to clarify, this paper recognizes the following as the normal sequence of events in the consumer-producer relationship which is characteristic of retail distribution in the Navy's Supply System:

a. A _need_ arises.

b. The _requirement_ (need) is recognized as a material deficiency.

c. The requirement is _communicated_ from consumer to producer.

d. The material is _located_ within the supply activity (producer).

e. The material is _picked, packed,_ and _transported_ to the consumer.

f. The transaction is _administered,_ i. e., stock and financial records are adjusted to reflect the issue.

In a single complete transaction each of these steps, from "need" to "administered", must be performed by either the consumer or the producer. The action party is clearly indicated in some of the steps. For instance, only the consumer can incur a need and only the consumer can recognize this requirement. On the other hand, it is a valid assumption that the producer is best able to administer the transaction. The steps which constitute the ends of the evolution are essential to the complete picture but relatively unimportant to the problem posed herein.

It is the middle steps of the transaction, e. g., identifying, communicating, locating, etc., which are pertinent in this discussion. These steps also must be accomplished by someone, consumer or producer, but there is at this point no clear indication whether they are performed more "efficiently" by the producing supply activity or by its consuming customers. In fact, it is a redefinition of the Problem to decide who must accomplish each of these mid-transaction steps.

Again, in this "Statement of the Problem" it may inhibit semantic confusion to define some of the key terms:

a. <u>Administer</u> - accomplish requisite paperwork to record fiscal and material data relevant to the issue as well as to make necessary financial charges and credits.

b. <u>Communicate</u> - relay from consumer to producer.

c. <u>Identify</u> - assign a unique verbal description, e. g., $8\frac{1}{2}$ x 10 lined pad of paper, or correlate with a Federal Stock Number.

d. <u>Locate</u> - determine to be at a specific site within the supply activity.

e. <u>Need</u> - synonymous with requirement; a material deficiency in this context may be a machinery failure due to parts, lack of office supplies, or the want of a general hardware item.

f. <u>Pack</u> - prepare for whatever means of transportation is envisioned.

g. <u>Pick</u> - physically lift from storage site.

h. <u>Transport</u> - carry from producer to consumer.

Before going on, it is appropriate to deliniate the assumptions which are held by the author in embarking on this study:

a. In the trend to self-service in the Navy's Supply System there is a significant and unreliable subjective element. The aura of efficiency which marks the businessman in government seems reflected in a superficial conclusion that what's good for free enterprise is good for Federal Government. Indeed, it is possible that "what's good for General Motors is good for the country" (or in this context, what's good for A & P is good for Navy retail distribution) but this is the sort of glittering generality which must be carefully evaluated and weighed.

b. Self-service may be appropriate to some circumstances and the best possible solution to certain local problems. However, it has been advanced as a panacea for far too many problems of supply effectiveness. It is, at first blush, a quick solution to the failure of consumers to plan ahead and to anticipate their needs. But its usefulness in this one respect does not make it a cure-all for the deeper problems of efficiency in retail distribution.

c. It is possible to develop some criteria, generally mathematical in orientation which will be useful, if not definitive, in evaluating self-service operations with respect to scope, initiation, continuance, and specific application.

The significance of this paper is two fold. First, insofar as the author has been able to find there has been no formalized attempt to make a general and a critical analysis of the application of self-service techniques to the Navy's Supply System.[5] Instead, there have been a number of articles lauding, albeit intuitively,

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the novelty of self-service's short range solution to problems of service to customers.[6]

Secondly, this paper is not intended as an effort to gather and analyze performance data from existing self-service operations. Rather in line with the stated assumptions, this is an effort to provide those criteria by which interested activities can perform their own analysis objectively. By this approach, hopefully will result a more generally useful tool for supply management.

CHAPTER II

REVIEW OF THE LITERATURE

In reviewing relevant literature, the author primarily searched for studies of self-service in particular and retail distribution in general. Taking "self-service" as a self-explanatory phrase, and "retail distribution" to encompass apportionment of commodities in relatively small quantities directly to consumers, the latest bibliography of the Defense Logistics Information Exchange includes no studies in this area. This bibliography purports to be a complete catalog of logistics studies both in-house and under contract to the Department of Defense.

A review of other potential sources oriented to military applications of retail distribution was little, if any more productive. The Rand Publications Index dated January, 1963 lists no related studies. Newsletter, Magazine of the U. S. Navy Supply Corps generally has confined itself to reporting the opening of new self-service marts at various activities ashore and afloat, making no critical analysis of this or any other specific method of retail distribution.

There is one piece of literature which is specifically to the point in question. BUSANDAINST 4400.59 authorizes and encourages the adoption of self-service among supply activities engaged in direct retail support. The reasons for this recommendation are discussed subsequently in this paper. This Bureau of Supplies and Accounts instruction apparently is the definitive piece of

literature on the subject of self-service application to military distribution.

Turning from military to civilian retail distribution, Harvard Business Review was utilized as the basic reference for research. Generally, references cited in HBR and published since 1955 were scanned for information, while the periodical itself was perused for the period 1928 to date.

For the most part, this reveiw was singularly unproductive. Nearly all works in the field of retail distribution skirt the subject of self-service, or other specific methods as such. There is either the tacit implication that self-service is obviously more efficient in terms of profit maximization or the comparison-contrast of this system with clerk service, for instance, is dodged completely in favor of discussing sizes and locations of retail units.

While the references cited in HBR were not to the point in question, three articles in the Review itself were significantly appropriate to this paper. In an article by William Applebaum and David Carson, entitled "Supermarkets Face the Future,"[7] the history of self-service was discussed:

"The first self-service grocery store was opened in Memphis, Tennessee, in 1916 by Clarence Saunders, who later made and lost a fortune in his Piggly-Wiggly chain. Sporadic efforts were subsequently made by various merchants in southern California and elsewhere to establish large self-service stores selling groceries and other foods on a cash-and-carry basis.

"In 1930, Michael Cullin opened the first unit of what soon

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became the King Kullen chain of supermarkets. He formulated clearly

the concept of the low-price, mass-merchandising supermarket."

Another article[8] discusses the raison d'etre for self-service

as a method of retail distribution:

"Reference has already been made to the phenommenal increase

in productivity which has accompanied the introduction of self-

service in the retail food business. Obtaining increased

productivity by making customers themselves perform part of the

distribution task is not a new idea. It was discovered long ago in

the mail-order business.

"It is particularly significant that the advantages of the

supermarket type of selling have appeared not only in payroll

savings arising from the reduction in front-store personnel, but

even more notably in the sales increases resulting from the greater

variety of merchandise purchased and the substantially larger size

of the average sales transaction. Estimates of the proportion of

the average sales check which is represented by unpremeditated or

spur-of-the-moment purchases run as high as 30% or 40%.

"The productivity angle in this is that a retail organization

can get greater productivity out of people employed behind the scenes

in preparing merchandise for effective self-selling than it can

get from people employed out in front supposedly to exercise alleged

salesmanship on an irregular flow of customers." Underlining was

added by the author to emphasize points particularly applicable to

this paper.

And another article[9] reiterates the essential rationable

justifying commercial self-service:

> Transfer of Functions. The principle of transfer of functions
> to the consumer received its first prominent application in the
> mail order business, generally at the hands of the large
> catalogue houses.•••the consumer himself clearly incurs a
> considerable part of the marketing task.
>
> This principle is an old one; but only a moment's reflection is
> needed to show that exactly this same principle is the one
> underlying the self-service operations in the modern supermarket.

To summarize this review of the literature, there appears to

be substantiation for this paper's initial assumption that the self-

service trend includes "a significant and unreliable subjective

element." This judgement derives in general from the dearth of

material on this subject, and in particular from the absence of

any literature reflecting study in appreciable depth of the

advantages or disadvantages of the mechanics of retail distribution.

With the significant exception - to be discussed - of HBR's allusion

to the transfer of functions from producer to consumer, it is almost

implicity assumed that self-service is inherently efficient.

CHAPTER III

OBJECTIVES, ALTERNATIVES, AND CRITERIA

Why self-service? What alternatives are feasible? And what criteria can be used to evaluate self-service and its alternatives objectively?

BUSANDAINST 4400.59 in encouraging the implementation of self-service sets forth the following "Objectives":

a. Expedite and improve service to customers.

b. Reduce cost of furnishing material to customers by reducing the workload involved in, and simplifying, the requisitioning and issue of material.

c. Reduce the number of bearer and high priority requisitions normally processed through the Supply Organization.

d. Reduce the number of "returned material" items. (Experience has proven that material obtained on a "self-service basis is rarely returned.)

e. Promote better utilization of standard stock items.

f. Reduce to a minimum stocks maintained by customer activities, by affording customers unlimited visits to the store to secure supplies as required.

g. Increase cost consciousness on the part of customers.

The same BUSANDA instruction contains the best exposition of those aspects which tend to make self-service an alluring system:

Under retail self-service supply operations, the entire supply and fiscal cycle is simplified. Items for which

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there is a constant demand are stocked, individually priced,
and displayed in counter-high bins for convenient self-service
selection. The customer selects his own material, and issue
accountability is recorded by means of a cash register type
sales slip. Stores personnel are no longer behind the
counters and are in closer, more interested and friendlier
contact with customers. Stores personnel are free to perform
necessary duties such as keeping shelves and bins well
stocked, rendering service to customers desiring help, marking
merchandise, maintaining the appearance of the store by
good housekeeping habits, and helping, when needed at the
check-out counter.

While the deliniation of subjective reaons involved is more
difficult than in the case of either objectives or aspects, it
seems epitomized by phrases sprinkled throughout the aforementioned
instruction. "Supermarket merchandising methods", "modern approach
to supply operations", "the entire • • • cycle is simplified",
"friendlier contact with customers" all of these are slogans of
efficiency to the entrepreneur.

The weakness common to these lists is that each is in effect
simply an enumeration of desiderata. There is no question that
maximum cost would be nice to have. However, in an economic
analysis of this or any other system maxima and minima are
mutually exclusive. To achieve the two simultaneously is
impossible and any implication to the countrary is misleading.

To convert these principles, expedients, and emotions to
tools of management, criteria are essential. It is entirely

conceivable that any attempt to "expedite and improve service to customers" will not "reduce cost of furnishing material to customers" but will in fact increase the cost of supply operations. To emphasize this particular point, the author obtained the following figures during an interview with officials of the General Services Administration:

Site	Cost per $100 of issues	
	Self-Service	S/I Requisitions
Washington, D. C.	$5.23	$2.80
Chicago	8.30	2.44
Clearfield, Utah	4.20	2.76
Los Angeles	4.20	3.55

These figures are total costs incurred, January 1964, in making issues through GSA self-service stores or from GSA warehouses. Delivery charges, capitalization of equipment, and material costs are not included so the comparison is as realistically valid as possible. It is clear that in this instance, at least, self-service is a relatively expensive system, when considering cost alone as the criterion.

Again, it seems conceivable that the impulse buying inherent in commercial supermarket merchandising[10] will carry over into the Navy and result in more rather than less returned or wasted material. And even more than conceivable, it is obvious that where entrepreneurs seek greater customer consumption, the Navy has no such objective. The point is that any prospective application of self-service must be carefully analyzed to determine which objectives

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are applicable, which aspects are actually appropriate to the situation, and whether costs, if incurred, do justify the "modern approach to supply operations".

And in this analysis there is the ever present danger of sub-optimization.[11] Commercial retailers initially shifted to self-service to reduce costs. Formerly, the firm's employees, retail clerks, had assisted each customer with the identification of the latter's needs, had picked from the shelves the desired merchandize, and, in many instances, had delivered the items to the customer. With the advent and popularization of self-service these elements of retail distribution were shifted from the retail firm to the customer. This is a vital distinction. Commercial self-service did not reduce cost by shifting any element in retail distribution from one unit in a retail firm to another unit in that same firm. Instead self-service shifted a part of the function to the firm's customers. And, in consideration of this, retail "prices" generally were lowered.

This element of private enterprise is not available to the Navy Supply System. Here self-service does not shift part of the retail distribution burden to the Navy's customers. The Navy is the customer and essentially the only customer of the Navy Supply System. Instead, the burden of pick, pack, and deliver is transferred from the producers in the Supply System to the consumers in the operating forces. And it seems highly likely that this is an additional workload which, when carefully evaluated, will be of little interest to the operating forces.
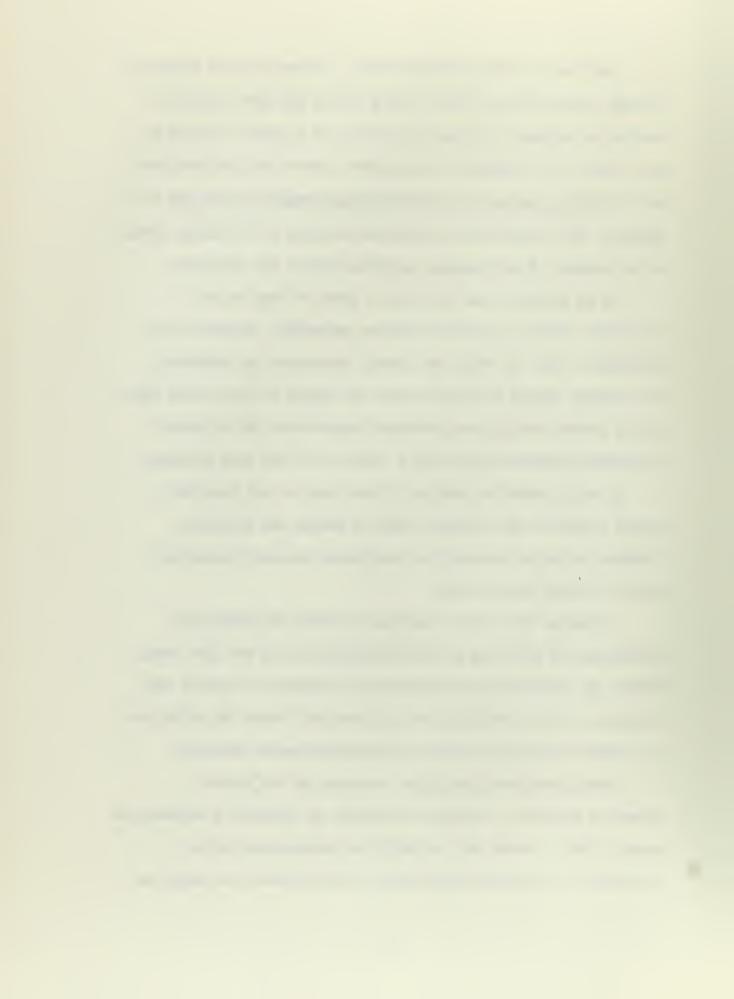
This then is clearly suboptimizing. Indeed, in some instances through self-service the local supply system may have expedited service to customers. It may even have done so while reducing its own costs. It is unlikely that improved service was achieved without an overall increase in costs when all elements of cost are considered. Any internal cost reductions achieved in the Supply System at the expense of the consumer operating forces are delusions.

Let me hasten to say that such a trade off may be most desirable, either in specific cases or generally. Whether it is desirable or not, it should be clearly understood and evaluated. The consumer should be able to weigh the impact of this or any other supply system upon his own operating organization and to decide objectively whether or not such a system is in his best interests.

It is my intent to provide in this paper a tool which will assist producers and consumers alike in making the objective judgement which is essential in considering the most appropriate means of retail distribution.

To fashion this tool, I propose to review the bidding by rephrasing the objective of retail distribution in the Navy Supply System, by deliniating the alternatives available to achieve this objective, and by developing the criteria with which the effectiveness and/or efficiency of these alternatives may be compared.

Having developed appropriate criteria, at the risk of obsessive modulism, it should be possible to construct a mathematical means, albeit a crude one, by which the alternatives may be considered for specific applications. This mathematical model may

then be used by supply activities when considering the establishment - or disestablishment - of a self-service system as well as in evaluating an existing ServMart.

What then is the objective of retail distribution in the Navy's Supply System. Considering this segment of the overall logistics picture, the governing goal should be framed in terms of supporting the mission of the Navy, be it the Fleet or the shore establishment. The objective is optimal response to consumer demands. "Optimal response" immediately begs the question of definition. Within the scope of this paper the term is considered to represent the following:

a. Given a specific supply activity's resources in warehouse space, man-hours, and inventory dollars - land, labor and capital.

b. Fill the highest percentage of demands in the shortest possible time.

This paper is not an attempt to revamp the entire Supply System. Therefore, the consideration of alternatives is limited to those retail distribution systems included in existing regulations. However, this does not seem a damaging constraint since there are significant variations among the authorized alternatives when considered singly or in permissable combinations.

These alternatives are:

a. Single line item, MILSTRIP, requisitions for all items. This is the system most familiar to producers and consumers alike.

b. Self-service ServMarts. This is a supermarket system

which has been adequately described herein and which is becoming increasingly familiar to consumers, and of which this paper is particularly critical.

c. Retail warehouses. Properly implemented this system could be an effective blending of the better aspects of single item requisitions and ServMarts. Rather than lapse into the subjective reasoning which this presentation has impugned, briefly the author envisions Retail Warehouses as permitting consumers relatively free access to standard warehouses, i.e., self-service without ServMart or any supermarket type facility.

d. Pre-expended bins. This system smacks of the anathema, "free issue"[12] but is conceivably an effective and efficient system in specific circumstances. Consumers draw their requirements from "bench stocks" as a need arises. The system is commonly used in Shop Stores for fast moving material of the nuts and bolts variety. For instance, prexpended bins could be utilized to support ships or other operating units under a common command. The system offers efficient possibilities in fast moving items under relatively stable conditions, e.g., common consumables to destroyers in Newport, submarines in New London, minesweepers in Long Beach, or aircraft squadrons at their parent stations.

With objectives and alternative established, the next step is to concoct a means of measurement and comparison, namely a set of criteria. These yardsticks must be framed in terms of benefits and costs. In this way, the alternatives may be compared in the degree to which they achieve maximum output with a fixed

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level of resources. Furthermore, the cost of each system can be developed by ground rules common among the alternatives.

The first of these benefits to be derived from "optimal response" is supply effectiveness or percentage of consumer demands which are filled by the producer activity. Since supply effectiveness, or service rendered, is a function of inventory level[13] it might be assumed that supply effectiveness would be the same for all 4 systems. This seems to follow validly from the common resource of fixed inventory dollars. However, 2 of the systems, ServMart and pre-expended bins, fragment available inventory and thereby create a potential reduction in supply effectiveness. Consequently, supply effectiveness either varies among the systems or an added cost is incurred in one or more of the systems to maintain a common percentage of demands filled.

A second benefit susceptible to comparison among the systems is leadtime. This is defined as the elapsed time from consumer's recognition of a need until consumer's receipt of requisite material. This definition differs, perhaps importantly, from the norm in that it includes that period between recognition of need and preparation of requisition. The definition as used in this paper is more appropriate to a study of retail distribution because in 2 and in some instances 3 of the alternatives considered no requisition is required for individual items. A necessary assumption in the definition used herein is that the consumer reacts to the need without significant delay on his part.

The elements of applicable cost criteria involved are sometimes obscure and may in fact vary in different circumstances and

among separate supply activities. However cost criteria generally
applicable are:

       a. Required investment in inventory, producer and consumer.

       b. Direct labor.

       c. Indirect labor.

       d. Inventory control equipment, e.g., data processing costs.

       e. Warehouse space.

To be meaningful, each of these cost criteria requires
amplification of those charges which must be considered:

       a. _Inventory investment:_ this is essential in comparing
the alternatives in terms of the imposition of additional
inventory requirements. For instance, the establishment of a
ServMart might ideally involve an initial inventory drain from
warehouse stocks without replenishment. However, this is unlikely
and the end result of initiating a self-service operation whether
it be a ServMart or pre-expended bins probably will be an increase
in inventory through the layering effect of carrying items in ware-
houses (for nonself-service, i.e., remote, customers) as well as in
a ServMart or bins. In any event, an analysis of the alternatives
must include this cost if it is incurred. Quantification of
inventory costs in the military is difficult. In constructing
the model in this paper inventory dollars are assumed to be
constrained to a fixed level. This interjects the implicit cost
of higher turnover of those dollars remaining for warehouse stocks
when a portion of what was warehouse inventory is devoted to a
self-service system. Again the implicit cost of higher turnover

is difficult to quantify but it might be stated in terms of more frequent orders in uneconomic quantities.

(Another vital factor in the inventory element is the fact that with self-service or pre-expended bins adequate inventory levels must be maintained in both ServMart or bins as well as in normal warehouses. Since item stock control records are not maintained for ServMart items[14] a demand from a non-self-service shopping consumer for an item which is in stock in the ServMart but NIS in the warehouses would generate false and excessive costs associated with NIS reactions to demands.)

b. Direct labor: this criteria encompasses man-hours devoted to actually making the issue, (filling the demand), without regard to requisite financial charges or inventory control procedures. A vital factor in this cost criteria is that it must include an evaluation of any functions which are transferred from producer to consumer, e.g., the consumer's time in ServMart shopping as opposed to his preparing requisitions. To reiterate for emphasis, since labor costs constitute a foremost justification for self-service in commercial applications, the cost of functions transferred to the consumer must be included in the cost of each system when studying retail distribution in the Navy. Furthermore, Serv-Marts entail additional labor charges related to individually price tagging and displaying the merchandise.

c. Indirect labor: primarily the costs inherent in pushing the paperwork associated with any of the alternatives. Again, the time of both producing and consuming personnel must be considered.

d. <u>Inventory control equipment</u>: this is included primarily to record the impact of the selection of an alternative which might require the recording of a significantly larger (or smaller) number of entries in stock or financial records. For instance, in shifting from single item requisitions to self-service, if each ServMart consumer drew 10 items on one requisition, recorded transactions might be reduced 90% and less expensive computers might be utilized.

e. <u>Warehouse space</u>: this cost criteria may be measured in terms of dollars or cubic feet. This paper considers it in the latter units in the assumption that the normal supply activity will neither build nor demolish warehouses in the selection of an alternative distribution system but is constrained by the space currently assigned. Dollar criterion applies to a comparison in the instance where additional space must be assigned to a supply department - or can be released by that department - to house either a ServMart or pre-expended bins. The appropriate value is a quantification of alternative uses of the space in question.

In summary then, in retail distribution in the Navy's Supply System, the objective is optimal response to customer demands. The alternative means of meeting this objective are (1) single item requisitions, (2) self-service, (3) retail warehouses, and (4) pre-expended bins. The criteria by which these alternatives may be judged are:

a. Supply effectiveness

b. Leadtime

c. Other system costs

CHAPTER IV

RESULTS

Having developed alternatives and criteria, the next order of business is to present a means of comparison and to test that tool with simulated data. The model which will be employed in this chapter assumes a supply activity of the order of magnitude of a supply department stocking 80,000 line items, and serving various customers which include one group of roughly similar operating units, e.g., squadrons of one type of aircraft, destroyers, or submarines. For these 80,000 items the maximum authorized inventory is $500,000.

The first step is the development of broad gauge information through the elemental tool of asking the right questions:

Who are the primary customers?

What commonality can be found among customers?

How can our 80,00 line items be segmented into more homogenious groups related to customers?

In this model these questions develop the following information:

a. Of the 80,000 items, 2%, or 1600 items may be considered fast moving consumables, e.g., show a maximum of 5 demands per month. The inventory for these items is $25,000.

b. Twenty thousand items, or 25%, have been drawn only by the one homogenious segment of customers, the destroyer squadron. The relevant inventory amounts to $125,000.

c. Another 20,000 items have not been drawn at all in the past 2 years.[15] These constitute an inventory of some $250,000.

On the basis of this information, the 80,000 line items carried are segregated into 4 issue categories:

1. High turnover items reflecting at least 5 demands per month.

2. Single segment customer items.

3. Items which show a high issue rate to the segment of similar customers, i.e., at least 5 demands per month from the destroyers alone.

4. Slow turnover items.

Chapter III developed proposed criteria and described the alternative methods of distribution. In this chapter, IV, items have been segmented into various categories so as to better analyze the available choices and avoid the unnecessary constraint of using one method for all material, regardless of the recorded performance data. The right questions have been asked and usable answers gathered.

The spadework, then, has been done and the time has come to compare the various alternative methods, for each category of material, on the basis of appropriate cost elements. Quite simply, an unsophisticated but revealing approach to model building in this application is to (1) set up a tableau of recorded data combined with some estimates, (2) perform the simple arithmetic of adding the cost figures, and (3) thereby obtain a relative evaluation useful as a tool to be used in making a more objective

judgement of preferable methods.

It is important to discuss in some detail the considerations employed in quantifying the cost elements for each system. It should be understood that these values will vary in each specific application. The model used here is intended to illustrate an approach to the problem of selection. The data are hypothetical. Consequently, similar, but not identical, models and actual data can be expected to produce different results.

Relevant to Figure 1, Inventory Investment includes the varying inventory levels and turnover characteristics required under each system to achieve a given level of producer response to customer demand. As mentioned previously, the variance in values reflects the increased costs resulting from the echelon- ing of inventory which is required by ServMarts or pre-expended bins. This fragmentation is unavoidable unless every customer is able consistently to use the self-service facility, i.e., is never operating away from the activity and the activity is never called upon to supply requirements for remote customers. This figure also includes an evaluation of the variation in the level of customer's inventory dictated by varying lead times. For instance, constant access to self-service will reduce the inventory level a customer must maintain to sustain his needs during lead time.

Direct Labor is an unambiguous, easily gathered, figure except for one vital aspect. This must include the opportunity cost derived from an evaluation of alternative use of manhours by the operating forces. If the self-service customer were not

browsing through the store what would he be doing and how much is it worth to his command. In the case of relatively highly trained specialists, ET's for instance, this could be a highly significant figure.

Indirect Labor also can be determined with relative ease although, again, there are opportunity costs to be considered in terms of alternative use of the time required to prepare requisitions and associated documents for instance.

The relationship in Inventory Control Equipment costs derives primarily from the number of transactions which must be recorded under each system and within each category. This cost will be reflected in the number of stock control clerks required or in the higher cost of greater capacity data processing equipment.

Warehouse Space must be assessed by one of two methods. The primary figure is the opportunity cost computed by determining the value of what the space might otherwise be used for. In an instance with which the author is familiar, additional space devoted to a ServMart could have been used for Public Work's furniture storage which was then costing the command $10,000/year under commercial contract. A second method should be used in the unlikely situation where opportunity cost is zero. In this instance, the figure used must reflect the higher cost of maintaining the space for a self-service operation, i.e., set up costs pro-rated, better lighting, generally improved appearance, and more frequent cleaning.

COST MODEL

Element	S/I Requisitions Issue Category				Serv Mart Issue Category				Pre-expanded Bins Issue Category				Retail Warehouse Issue Category			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Inventory Investment	1.-	1.-	1.-	1.-	1.50	2.50	1.50	2.-	1.50	1.75	1.50	2.-	1.-	1.-	1.-	1.-
Direct Labor	2.-	2.50	2.-	3.-	2.50	3.-	2.50	6.-	2.-	4.-	2.-	6.-	2.50	2.50	2.-	3.50
Indirect Labor	1.-	1.25	1.-	1.50	.50	.75	.50	1.-	.10	.75	.25	1.-	.50	1.-	1.-	1.50
Inventory Control Equip	1.-	1.25	1.-	.75	.50	.75	1.-	.75	.50	.75	.50	.75	.50	.75	1.-	.75
Warehouse Space	1.-	1.-	1.-	1.-	1.25	1.50	1.25	1.75	1.25	1.50	1.25	1.75	1.-	1.-	1.-	1.-
TOTALS	$6.-	7.-	6.-	7.25	$6.25	8.50	6.75	11.50	15.35	8.75	6.50	11.50	5.50	6.25	6.-	7.75

4/④   4/① 4/②   4/③

All figures are per demand.

Figure 1

Issue Category	Best Cost Performance
	(Hypothetical Data)
1	Retail Warehouse
2	Retail Warehouse
3	Pre-expended bins
4	Single item requisitions

Figure 2

Figure 1 models the cost data for the hypothetical supply activity used in this illustrative situation. All figures shown are estimates of what can be computed in the real world, for the elements as described.

Figure 2 summarized the results of Figure 1. This model simulation shows that this hypothetical supply activity should employ 3 channels of retail distribution, retail warehouses, pre-expended bins, and single item requisitions. It is vigorously reiterated that these model results do not constitute the final answer. This is merely a tool, albeit an important tool, by which an objective judgement may be made. This is an alternative to intuition and an aid to carefully reasoned analysis.

In closing this chapter, it should be noted that a variation on this theme is the quanitification of fewer elements. Under this approach cost figures would be assigned to all elements except Inventory Investment and Warehouse Space. In this modification the analyst would consider the cost comparison among fewer elements and use reasoned comparison - avoiding intuition insofar as possible - to account for the varying inventory and space utilization aspects. This approach is justifiable only when quantification of these factors is considered impossible.

CHAPTER V

SUMMARY

To sum up briefly, this paper sought to investigate alternative methods of forging the final link in the logistics chain between producer and consumer.

Starting with the author's admitted biases, recent trends in retail distribution are described. A review of the literature in this field points up a lack of careful study in depth. However, some relevant writings belie the popular assumption that self-service is in most cases the most efficient system. Indeed, it appears that the basic reasons for the development of commercial self-service have no application to the Navy's Supply System.

In Chapter III objectives, alternatives, and criteria are developed. Subsequently, these criteria are employed in Chapter IV's Cost Model to evaluate simulated data.

Admittedly, the distinct possibility exists that the simulated data utilized are not without bias. The figures may reflect some juggling to prove a point. Nevertheless, the basic purpose of this study is illustrated by the Cost Model. It is essential that each supply activity conduct its own careful and complete analysis of alternative systems before joining the parade to self-service. There is no justification for subjective reasoning, emotional evaluation, or blind acceptance of any distribution system. An objective study of possible methods can and must be conducted in each instance.

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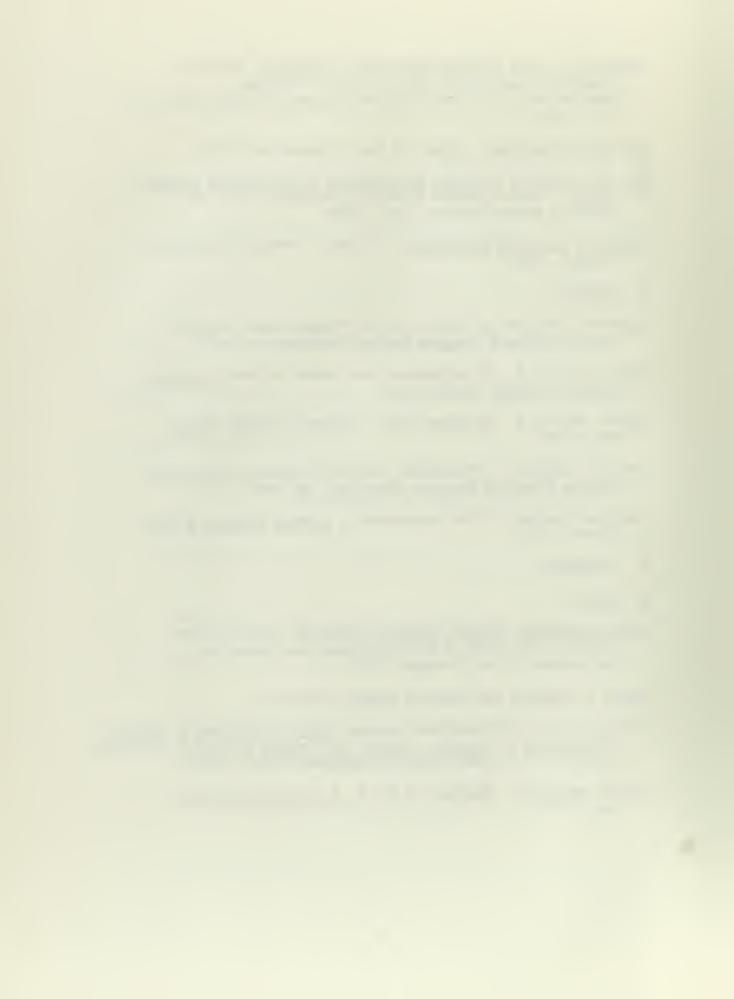   Management Association Report No. 49. New York:
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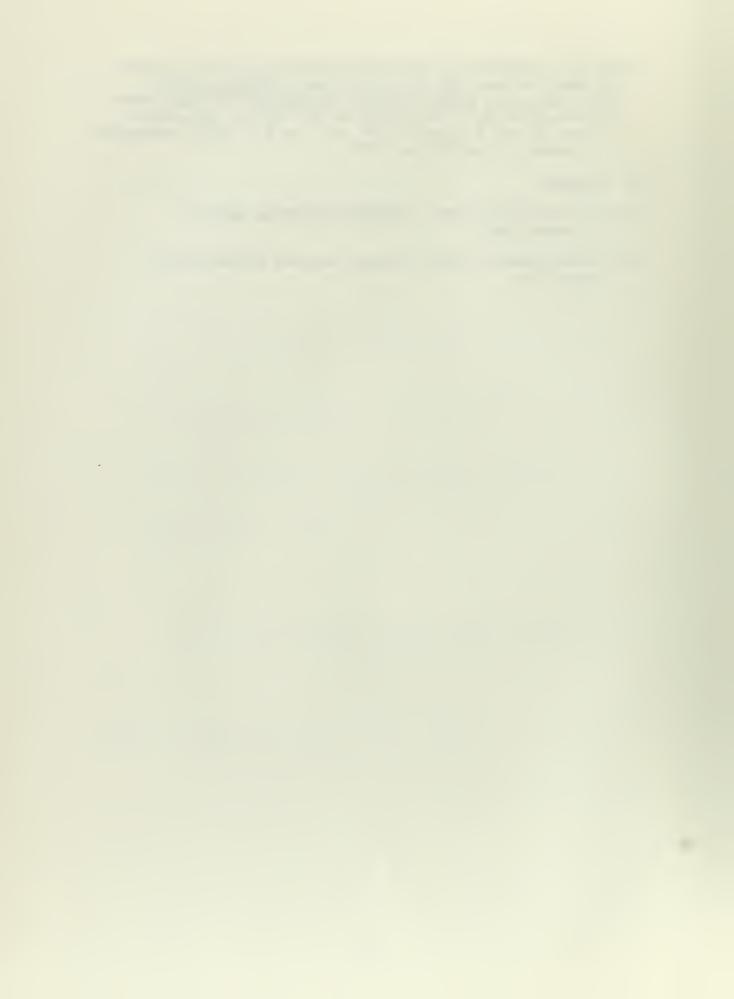   Winter, 1938.

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